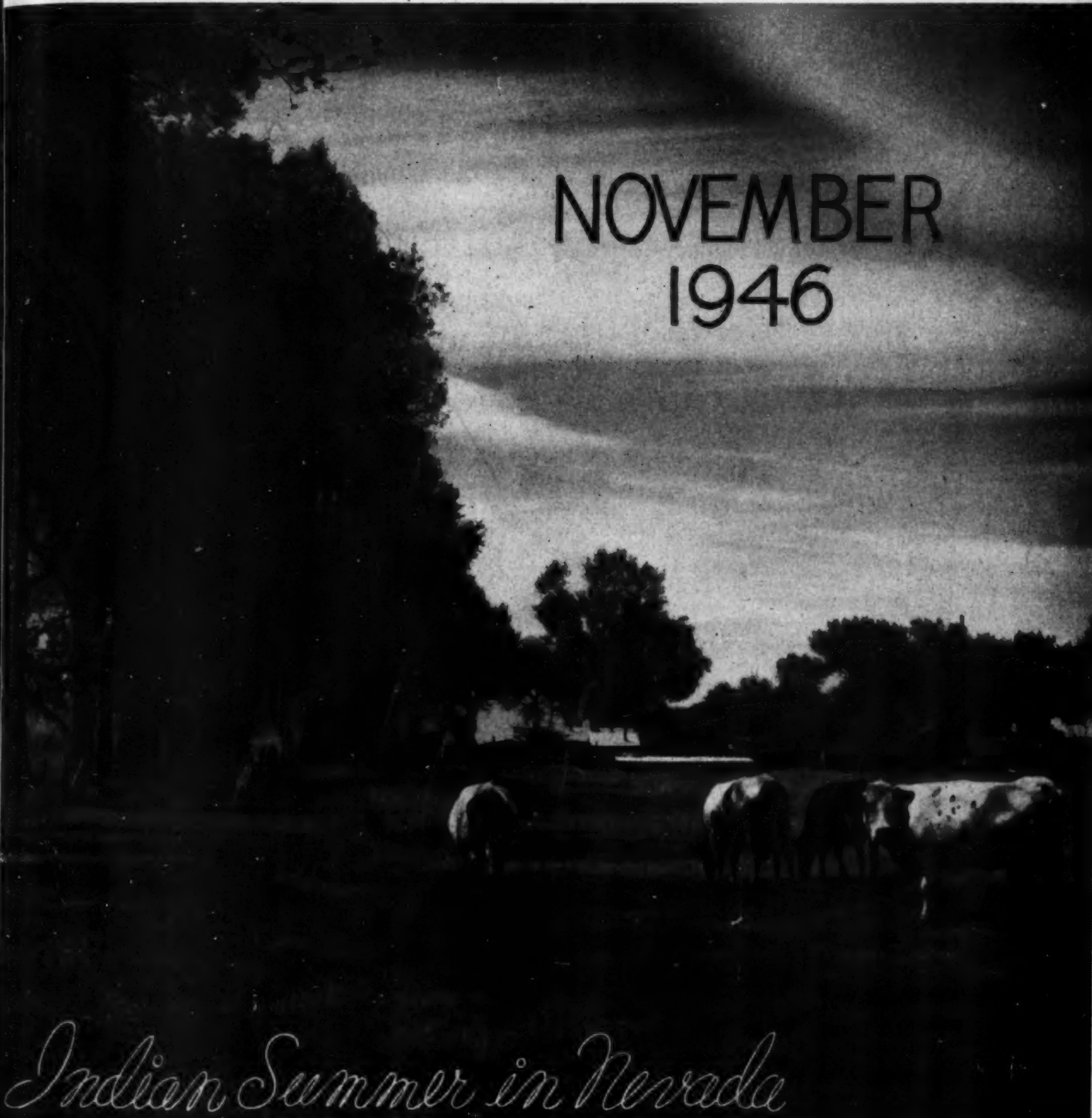

NOVEMBER 1946

Indian Summer in Nevada

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

SOIL CONSERVATION

CLINTON P. ANDERSON — SECRETARY OF AGRICULTURE

HUGH H. BENNETT — CHIEF, SOIL CONSERVATION SERVICE

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WELLINGTON BRINK, EDITOR

CONTENTS

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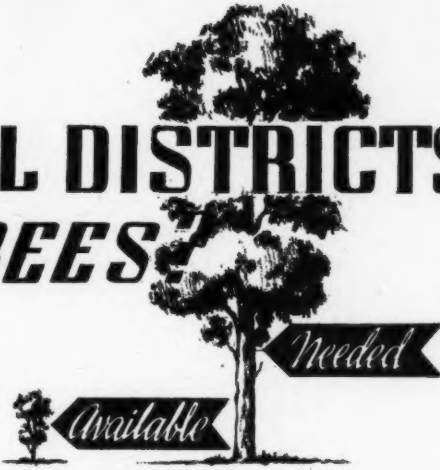
Where WILL DISTRICTS GET TREES?



BY JOHN W. KELLER

PLANTING of forest trees is encouraged by Government agencies in nearly all parts of the United States, not only where rainfall is sufficient to keep the planted trees alive but in many places where irrigation is required. In humid areas tree planting is recommended for wood production; in the Great Plains for windbreaks to protect farmsteads, crops, and livestock; in all regions, for conservation of soil and water. Without tree planting it would be difficult, if not impossible, to put on an effective soil conservation program in some parts of the country. On many steeply sloping areas trees are the only kind of cover that will hold the soil. The dense cover of pine needles conserves water and prevents soil erosion. According to Soil Conservation Service estimates, almost 12 million acres in fields and gullies in the United States should yet be planted to trees by cooperators in soil conservation districts. To plant such an area, more than 12 billion trees would be needed.

Pine needle litter in an 8-year-old loblolly pine plantation which effectively conserves the moisture and prevents soil erosion.

At the 1945 rate of planning by SCS technicians, it would take 130 years to complete plans for this much plantings. At the 1945 rate of tree production, the 12 billion trees would become available only over a period of about 200 years. At the 1945 rate of planting, 425 years would elapse before the work was finished.

In 1945, SCS technicians planned tree planting as the best use for 91,754 acres of land. This brought the total area of fields and gullies for which they had planned such use to 473,510 acres. In that year 25,000,000 trees became available to district cooperators for planting, and the cooperators planted trees on 25,873 acres. This brought the total of land they had so planted to 219,350 acres. We hope that in 1946 the total area planned will be increased by 183,508 acres. Our goal for 1946 is double the 1945 figure. We have every reason to believe that this goal will be reached.

New soil conservation districts are being established almost daily. Planning procedures are being simplified. The Service has entered upon a planning schedule that calls for planting more than 200 million trees each year. To catch up with the plans made, to the end of 1946 district cooperators would have to get hold of more than 428 mil-

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NOTE.—The author is assistant chief, forestry division, Soil Conservation Service, Washington, D. C.

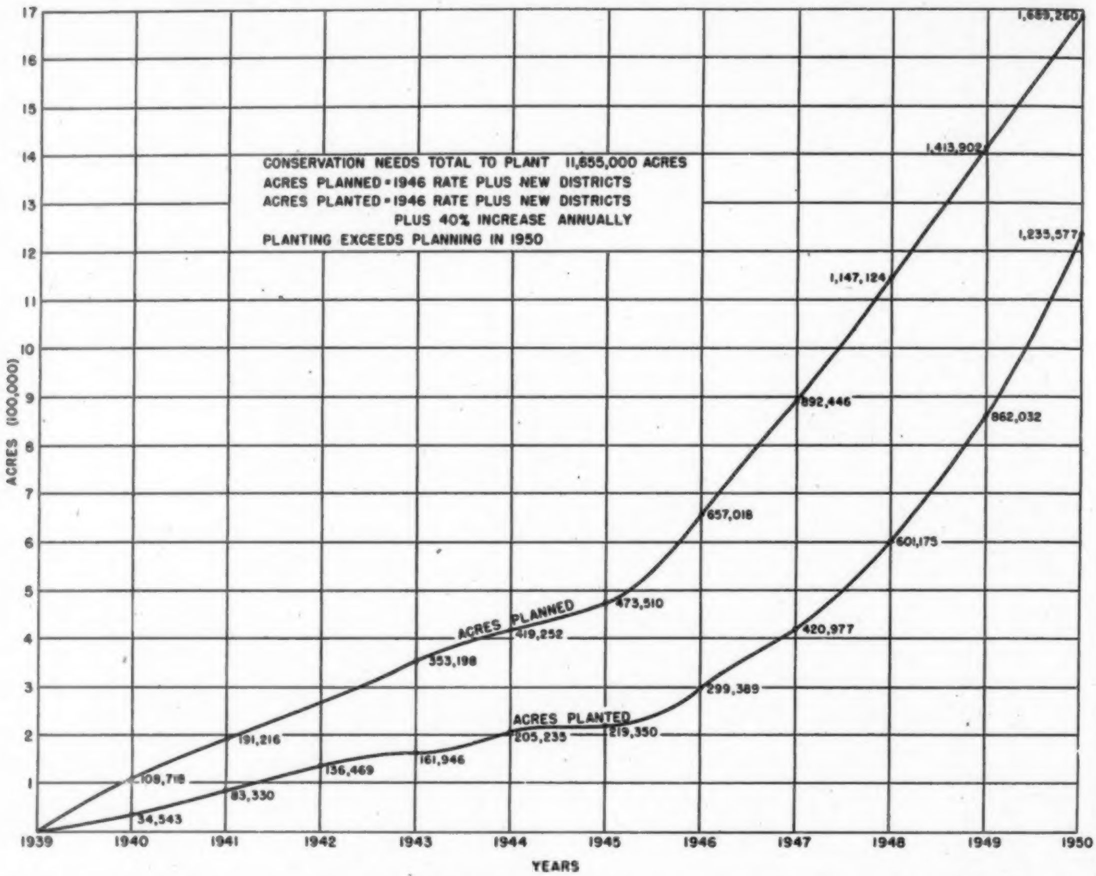

Figure 1.—Forest tree planting planned by SCS technicians and carried out by soil conservation district cooperators. The planning curve was projected on the basis of the 1946 trend of increase; the planting curve was projected on a corresponding basis with an additional increase of 40 percent annually. In each instance, the expected increase in number of soil conservation districts was taken into consideration.

lion trees. Only about 60 million trees are in sight, however.

Since 1940 when the present records were started, SCS planning has exceeded planting by a greater and greater margin. We are now planning more than twice as fast as cooperators are planting. Companion curves are shown in figure 1, based on actual tabulations for 1939–45 and on calculations for 1946–50. Not until 1950 does the gap between planning and planting become narrower.

Obviously, this means that we are not getting the job done and we are not getting sufficient protection against erosion. Tree planting on farms must be stepped up if the soil resources of our country are to be saved. The planner recognizes the need for tree planting. The cooperators agree, and want to plant. But the existing supply of trees falls far short. To give district cooperators an extra incentive, in each region the SCS has offered to furnish a limited number of trees to any cooperator. We buy "incentive" trees from State nurseries if they are available. Otherwise, so far as possible, we grow them in SCS nurseries. The number of trees produced in SCS nurseries dropped from 143 million in 1940 to 20 million in 1945. This was due partly to wartime labor shortage, partly to recognition of the fact that Clark-McNary nurseries are logically the main source of forest-tree planting stock. Nurseries operated by State foresters with Federal assistance under the Clark-McNary law, fell off in production from 98 million trees in 1941 to less than 38 million in 1945. Commercial nurseries cannot be depended

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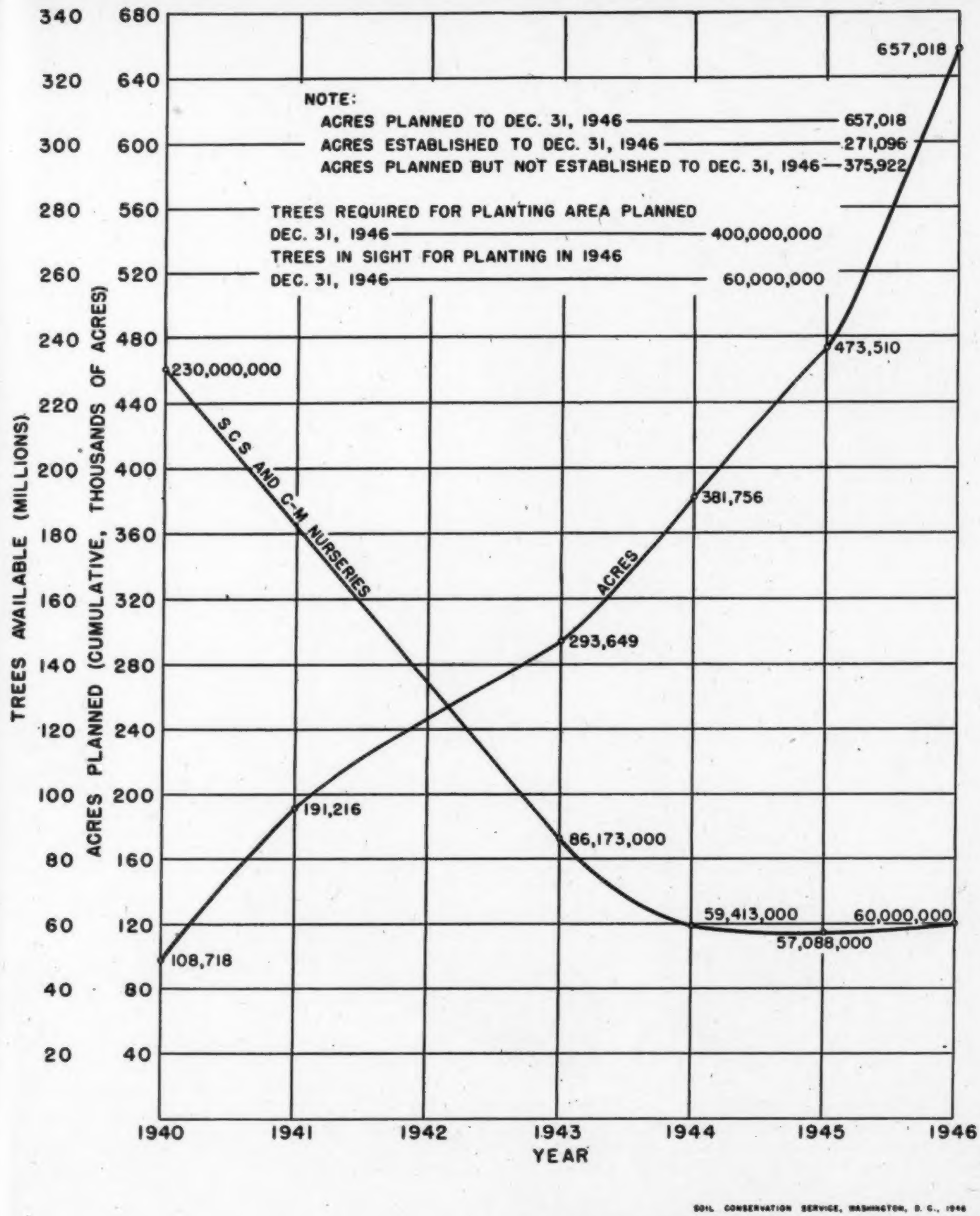

Figure 2.—Acreage of fields and gullies for which forest tree planting has been planned in 1940–46 by SCS technicians, in contrast with numbers of trees that have become available for such planting during that period in SCS and Clark-McNary nurseries.

Introducing InLaC

by DOROTHY ROWE

English farmers whose fruit trees need pruning may be able to engage the services of Jack Blackwell if InLaC should happen to send him overseas. Jack is pruning 1 of 1,500 producing trees in a 15-acre peach orchard in South Carolina.

At present Roger Yule is a bit young for InLaC. Later he may have a chance to show English farmers how he plows corn on the contour in Faribault County, Minn.

Farmer Blubaugh's daughter-in-law is good at picking high-yield apples. If she takes after her famous father-in-law (see pp. 51–52, *Soil Conservation* for September 1944) she has plenty of up-to-the-minute ideas on farming to pass along to others.

WHEN young people back a movement, watch out! They're clever at thinking up new ways of doing things—and quick to put those thoughts into action. The International Land Club is in process of being organized in America. InLaC (for short) already is under way in Great Britain. One of its aims is to help young people see for themselves how other nations are meeting their postwar land problems.

Here is how it will work out. Young people in Great Britain and the United States will visit each other's countries to widen their knowledge of proper land use. As the plan develops it may later be expanded to include young people in agricultural communities in Europe as well as in America and the British Empire.

InLaC membership will comprise girls and boys of 17 and over who give evidence of a genuine interest in the land and in rural life. An important byproduct of the venture is that it will foster friendship and good relations between English-speaking nations and the peoples of Europe.

By 1947, when the organization will begin to function, it is expected that youth ships may be operating between England and the United States, offering the round trip at a cost as low as $75 plus $1 per day for food.

The heavier expenses of overseas travel will be financed by a central fund, and a current account for local administrative expenses will be financed by subscription. At present all work is being done voluntarily, and all funds are being raised by members. But when the first exchanges have been successfully carried out, grants will be sought.

In England members are raising money for the central fund by arranging dances, entertainments, and whist drives. The young people are preparing for visits abroad by becoming informed on conditions in other lands. At the same time they are storing up knowledge about Great Britain and the Empire. Youth hostels will be a meeting place for club members and overseas visitors.

The exchange plan was drawn up to help young people who neither would attend college nor have the means to travel abroad but who would profit from training in world citizenship. The idea was evolved especially from the Women's Land Army in England.

Eventually farmers in the United States will have an opportunity to indicate whether they can use the services of English workers and if so, how many. This will help the directors in placing the young people to good advantage. Similarly, district supervisors interested in having some of the young people from their districts get farm experience in England will be asked to forward their names to the proper authority.

Already Mr. and Mrs. Monroe Smith, co-directors of American Youth Hostels, Inc., have offered a year's work to a member experienced in dairying. The organization has a farm in connection with its International School at Meredith, N. H., where members were trained for emergency labor during the war and were then placed on New England farms.

At Washington Court House, Ohio—about 30 miles from Columbus—arrangements are being made for an exchange of English land workers and local farm youths. Ohio has a group of young land workers who are practically organized, according to Harry Culbreth, organization director of the Ohio Farm Bureau Federation. This group corresponds in age to the InLaC membership: 17 to 35. The young people are those who wanted to join the armed forces but could not be spared from the farm. "They are enterprising, with a great capacity for raising funds," said Director Culbreth.

Besides American Youth Hostels, Inc., and the Ohio Farm Bureau Federation, other organizations that have volunteered assistance are: The English-Speaking Union, Associated Country Women of the World, Youth Hostels Association, National Farmers' Union, National Association of Girls' Clubs, the National Council of Women, and the Y. W. C. A.

How do young people in this country regard InLaC? Two girls who were among the first to put in an application to go overseas wrote as follows:

> We are both tremendously interested in the idea. Though we realize that living conditions abroad are not easy, we are anxious to work hard and do our best to make the project a success. We both have had quite a bit of farm experience and feel that we may be able to help on whatever needs to be done.
>
> We are particularly interested in living with a farm family, if that is possible, since we want to learn something about the life of the country. We realize that the amount we could earn would not cover our expenses, and are able to pay a good part of them.

There's no telling how far InLaC will go once it gets a good start. Certainly there never was greater need for putting soil and water conserva-

(Continued on page 81)

Girl Scouts Save soil

by FANCHON HAMILTON
CAMP ADVISER of GIRL SCOUTS

ACTUAL practice in the use of good conservation methods provided both fun and useful skills for 48 senior Girl Scouts from Ohio, Kentucky, and West Virginia who attended Camp Molly Lauman near Lucasville, Ohio, last summer.

Operated as a demonstration the camp was intended to show what Girl Scout camps all over the country can do in conservation education.

The project was an experiment sponsored by the Girl Scout Regional Camp Committee, with the backing and support of thte National Girl Scout organization.

Consultants from the Ohio Department of Conservation, the Forestry Division of Ohio, the United States Forestry Service, Friends of the Land, the Ohio Reclamation Association and the Scioto County Conservation Club enriched the program and helped to make clear the relation of each phase to the other.

Among the most popular activities were the building of check dams and making of diversion ditches in badly washed areas. Rainy days were anticipated with eagerness because the girls' efforts were proved successful and new work projects turned up. New trails were made and old ones improved by making switch backs where the need was evidenced. Gullies were healed and bare washed areas were staked and covered with brush.

The camp garden was of special interest this year. Besides cultivating the soil and covering the ground with compost mulch, the girls suckered plants and picked off injurious insects. They tested types of soil, and discussed the relation of soil fertility to food and nutrition.

With the help of the forester they learned to heal in trees, to plant and transplant. Pruning was done in some areas. Grapevines and green brier were cut out where they were harmful.

A forest ranger taught the Scouts safety precautions and discussed selective cutting, woods improvement, and good logging practices. Fire prevention and other necessary precautions played a part in each day's activities. The Scouts familiarized themselves with fire laws affecting wooded property. These were observed as they prepared cooking and campfire spots and fire-fighting equipment was kept ready for use at all times.

Throughout the summer the girls learned proper care and handling of tools such as the crosscut

saw, axes, mattocks, fire rakes, shovels, hoes, and spades.

They took observation trips to see good practices in contour farming and strip cropping, as well as areas where much careful planning and application was needed.

These and many more actîvties were interspersed with the usual singing, folk dancing, swimming, and cooking out of doors.

Trips to the Roosevelt Game Preserve and films loaned by the United States Forestry Service added a great deal to the program.

Each girl is returning to her camp and her community feeling the responsibility for educating other girls and many adults in how to conserve our country's natural resources.

Introducing InLaC

(Continued from page 79)

tion practices on the land than there is today. Progressive farmers know that the advantages of safe, scientific farming are many. But if there were only one—the average 20 percent increase in per-acre yields of various important crops—it would still be the key to preventing starvation in other lands.

Mrs. Neve Scarborough, petite, attractive brunette who is setting in motion the wheels of InLaC in America, is enthusiastic about its possibilities and its chances for success. With such inspiring leadership the young members of International Land Club should accomplish much in helping to find solutions for land problems in their own countries. Her enthusiasm is not based on lack of experience either, for she was an executive of the Famous Women's Land Army in England during World War II and knows what young people—especially girls—can do on the farms.

As Soil Conservation goes to press, Mrs. Scarborough reports:

"Our membership in England is growing rapidly, and 25 percent of the members have made their first pilgrimage to Denmark very successfully this year. Next year those whose jobs won't allow them to come so far afield as America or Canada will be going to Holland. And I have now had my first eager inquiries from India, where, it is felt, it should be established to operate provincially first, and then internationally." So we progress, despite the set-backs.

Where will districts get Trees?

(Continued from page 76)

upon as an important source of trees for planting by district cooperators. Usually their supplies are limited, and their prices necessarily are high. The total production of trees in Clark-McNary and SCS nurseries in 1946 is expected to be less than 60 million (fig. 2) and, of course, not all the Clark-McNary nursery trees will be available to soil conservation district cooperators.

The Soil Conservation Service is interested in seeing that trees are available not only to meet incentive needs but also to complete the recommended planting. The Service is encouraging State foresters to greater production in Clark-McNary nurseries. It is assisting them to plan accurately by making available to them all the planning figures—total acres planned for tree planting, acres planted to date, and age and kind of trees needed annually to fulfill SCS plans. The Service is encouraging soil conservation districts that need large quantities of trees to operate their own nurseries. It is helping districts which operate nurseries by furnishing technical assistance, the use of available equipment, and supplying some seedling stock for transplanting. Also, it is encouraging private tree nurseries in every possible way to produce trees of high quality at reasonable prices.

What action will be taken by public and private nurserymen to meet the anticipated demand for trees? How will private nurserymen respond? If private nurseries are unequal to the task, the Federal Government must look to the Clark-McNary nurseries. What action will State foresters take to increase production and to grow the trees that are needed?

Tree planting, a very important soil conservation practice, must not be permitted to fail for lack of trees. If private nurseries cannot grow enough, State nurseries should try to do so. If State nurseries fail, then the Soil Conservation Service nurseries must carry the load the best they can until State and private nurseries are ready to take over.

THIS MAGAZINE MAY BE PURCHASED

Soil Conservation Magazine is available at $1 per year (domestic) from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Every month it carries the news of new techniques and of progress in the districts.

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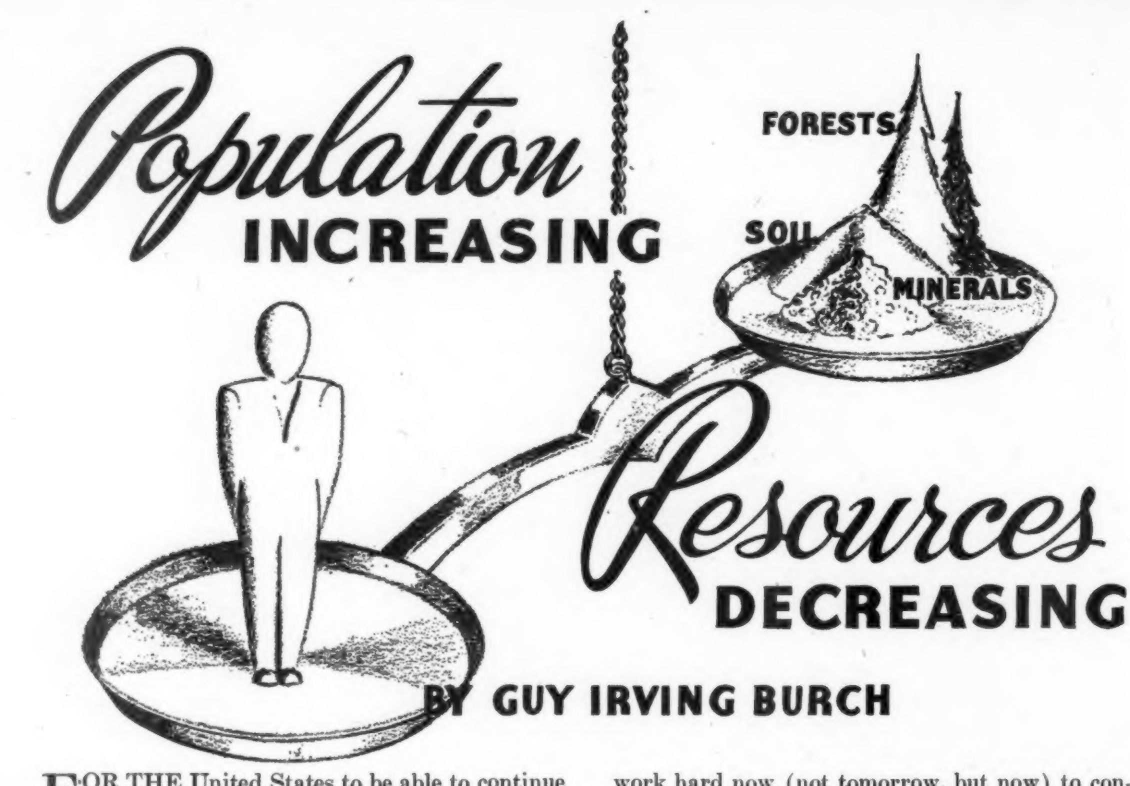
Population INCREASING Resources DECREASING



BY GUY IRVING BURCH

FOR THE United States to be able to continue to support for any considerable length of time its present population of 140,000,000 (or even a population of 100,000,000), it must have at least four things: (1) An adequate supply of top soil, (2) an adequate supply of minerals, (3) an adequate supply of timber or forests, (4) a high quality of people.

As far as I can find out from a long study of Government and private sources, the United States does not have sufficient quantity of the first three nor high enough quality of people. Furthermore, all of these resources are on the decrease—some of them alarmingly so—and we are recklessly wasting all four.

This is not a pretty picture. It means that the American level of living and American traditional institutions of freedom have a short life ahead of them. People now living may witness the fall of the American Republic. On the other hand, most sources I have consulted believe there is a hope of escaping these disastrous results if we will all work hard now (not tomorrow, but now) to conserve and strengthen these natural and human resources.

In this whole picture I believe the population factor is basic. We cannot conserve our top soil, our minerals, our forests, nor the quality of our people, with a policy of trying to support more and more people at any price. With such a policy we find it necessary to exploit recklessly our natural resources as we have done in the past. That we *have* done these things in the past, I could quote from any number of qualified authorities, as we have done in our book *Population Roads to Peace or War*.

Briefly, what I mean is this: "Population density and economic conditions," say Nichols and Chambers in the Department of Agriculture Yearbook, 1938 (p. 652) "will sometimes dictate land-use practices and produce situations where cultivation is necessary on severely eroded land that should normally be retired, or on slopes too steep for safe tillage."

This has actually happened over and over again in all countries of the world including the United States (which is going through its wealth

NOTE.—The author is director, Population Reference Bureau, Washington, D. C. His article is taken from a paper presented at the Fifth Annual Conference on Conservation, Nutrition and Human Health, Athens, Ohio.

of natural resources faster than any other country).

* * *

The United States has had a double drain upon its soil, minerals, forests, and the water and wildlife that go along with these natural resources. The first drain was the rapidly increasing American population itself. Some of this drain may have been necessary, although for all practical purposes our population did not have to increase as much or as fast as it did. P. K. Whelpton of the Scripps Foundation for Research in Population Problems has pointed out that a stationary population of 100,000,000 would have been better from an economic point of view than our present-sized population of 140,000,000, (*Journal of Heredity*, September 1939)

* * *

The elder statesman Mr. Bernard M. Baruch has suggested that we take stock of this whole situation. In a letter to Congressman Gore November 3, 1945, Mr. Baruch said in part: "We cannot go on depleting our soil and mineral resources as we have in the last 70 years without tragic results to our whole economy and national life. A study of our resources and modern scientific methods to replenish the must be undertaken quickly."

Briefly, the situation is this. The United States is already exploiting its natural resources at a dangerous rate as regards to the future of its present population of 140,000,000 (or even the future of a permanent population of 100,000,000).

* * *

I certainly will not take advantage of your good nature by reading you long quotations from the Interior's annual report or still more detailed studies about the outlook for our mineral resources. But permit me to quote just a sentence or two. After saying that the drain on our natural resources due to the war has been "staggering," the Secretary of the Interior says: "Only 9 of the major minerals remain in our known domestic reserves in great enough quantity of usable grade to last 100 years or more. Our known usable reserves of 22 essential minerals have dwindled to a 35-year supply or less. * * * it behooves us to learn the true meaning of our meager supply, which is not that we will be weak in a hundred years, but that we are relatively weak now" (p. v, vii).

I am tempted to quote further from this report and from other reports such as that by Elmer W. Pehrson, Chief, Economic and Statistics Branch, Bureau of Mines, "The Mineral Position of the United States and the Outlook for the Future," February 19, 1945. But I must leave the details to your imagination. True, we are "producing" great quantities of minerals (that is, we are digging them out of our land faster with our new machines), but says Mr. Pehrson "It follows that the faster we grow in industrial strength and military potency—a growth made possible largely through mineral ouput—the faster we liquidate the very basis of our power" (p. 1). Incidentally, our *new* techniques have not enabled us to keep pace with earlier rates of *discovering* new mineral reserves.

Much the same story may be told about our diminishing top soil and forests. No doubt many of you are familiar with the statements of Dr. Hugh H. Bennett, Chief, United States Soil Conservation Service. Dr. Bennett's testimony before the House of Representatives Labor Committee, February 24, 1939, also can make the cold chills run up your back. He *repeated* the statement that we do not have enough good land left in the United States, and added that we are losing every day as a result of erosion the equivalent of 200 40-acre farms.

In a more recent work, "Our American Land," 1946, Dr. Bennett writes: "*So we have no more land to lose.* Actually we need more good land for crops now. Too many farmers are working poor land that should be turned back to grass or woodland. *More waste of good land would amount to a national crime* on the part of those who are responsible—meaning ourselves. Yet we are allowing 500,000 acres to go down to ruin each year" (p. 5).

In terms of tons, this means a loss from farm land alone of "about 3 billion tons of soil (enough to fill a train of freight cars girding the equator 18 times) are washed or blown away each year." In terms of money it means nearly 4 billion dollars annually. ("Soil Erosion in the United States," undated, United States Soil Conservation Service, p. 2).

There seems to be little doubt about it that our Soil Conservation Service can slow down this tremendous rate of soil loss to adequately support 100,000,000 Americans on a more or less per-

(Continued on page 91)

SCIEN

by HUGH BENNETT

This photo illustrates the eight classes of land: Class I.—Very good land that can be cultivated safely with ordinary good farming methods. Class II.—Good land that can be cultivated safely with easily applied practices. Class III.—Moderately good land that can be cultivated safely with intensive treatment. Class IV.—Fairly good land, best suited to pasture and hay; can be cultivated occasionally. Class V.—Suitable for grazing or trees; needs only good management. Class VI.—Suitable for grazing or trees; needs protective measures. Class VII.—Suitable for grazing or trees; needs extreme care to prevent erosion and eliminate other hazards. Class VIII.—Suitable only for wildlife or recreation; usually steep, rough, stony, wet, or highly erodible. (Method developed by Soil Conservation Service.)

WHAT ***is Soil Conservation Science?*** Soil conservation science is primarily concerned with the determination of facts and principles fundamental to the permanently productive use of land. Such use calls first for essential protection of the land against removal of the soil by erosion, for conservation of rainfall, for removal of water where there is too much and its addition where there is too little. Various other supplementary or special measures and practices are applied toward this end, as called for by the physical facts and conditions involved with each situation.

CE and PRACTICE of SOIL CONSERVATION

Gullying on steep, formerly cultivated field; Wooster and Lordstown soils. This is now class VII, no longer valuable for cultivation and not much use for anything.

Alternate contour strips—cultivated and close-growing crops. This method, developed by Soil Conservation Service, effectively controls erosion and reduces loss of rainfall as run-off on moderately sloping land. The width of the strips varies with steepness of slope and erodibility of the land. Class III land.

These basic facts and principles are determined through systematic research designed to provide for the advancement of the practice of soil conservation.

Soil Conservation Practice. Procedure in soil conservation is based on scientific principles arrived at through quantitative measurements of rates and processes of erosion and loss of rainfall under varied conditions of soil, slope, climate, and cropping practices. Soil conservation, therefore, is the scientific use of land in accordance with its physical aspects.

In order to put the scientific principles of soil conservation into practice, it is necessary for the conservation technician who prepares farm plans—and helps install them—to have a map of the farm which shows the precise location of the areas of the various kinds of land, appraised according to use capabilities.[1] For practical farm and ranch purposes, eight capability classes of land have been developed through processes of simplification of the physical characteristics of the land, as ascertained through conservation surveys. With such a blueprint of the farmland in his hand, the technician goes carefully over the entire farm, accompanied by the operator, and develops on the ground, in full cooperation with the farmer, a conservation plan for each distinctive important parcel of land comprising the farm tract.

Because of economic limitations of the farm operator, type of farming, inclination of the farmer, or location, it may sometimes be necessary to vary the recommended farming operations in some degree from the practices actually called for by the land conditions; but the guiding principle, nevertheless, is that the nearer the plan can come to meeting the requirements as determined by land conditions, the better the farm plan will be from the standpoint of stabilizing the land and keeping it productive while in use.

Areas are frequently found where such features as steepness of slope, thinness of soil, and marked susceptibility to destructive erosion (Land Capability Class IV) make it necessary, for best results, to limit the growing of cultivated crops to relatively short periods—usually not more than 1 year at a time for crops like corn, cotton, and tobacco. After such a brief period of cultivation, the field is turned back to a long rotation devoted to soil-holding, soil-building crops, such as grasses and legumes.

A national program of research is carried on continuously in support of sound soil conservation practice. New and better methods for checking wastage of soil and loss of rainfall as the result of improper use of land or lack of protection are constantly being sought. Answers to those farm problems that are continually coming up are sought through this research program. Land

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[1] Many thousands of measurements have been made at the soil erosion experiment stations and elsewhere of soil and rainfall losses from important agricultural types of land throughout the country. A great variety of soils, slopes, crops, and cropping practices, and weather conditions were carefully considered, in the interpretations drawn from these measurements.

Two views of the same streambank area, lower Winooski River, Vt. At right, valuable bottomland being destroyed by erosion; at left, control achieved by brush matting. (Work by Soil Conservation Service.)

characteristics and conditions are so varied, in fact, that for a long time to come considerable research is likely to be necessary, at some points of the national program, in order to determine precisely what course to pursue. In other words, it is necessary to keep soil conservation practices at all times carefully adjusted to the requirements of the land, and research in this field therefore is one of the tools for getting the job done.

While it was known in the beginning that all pertinent facts relating to the many phases of the complicated procedures of sound agriculture had not been determined, we did have, in the early stages of the national program of soil conservation, the advantages of farmer experience to draw from. Then, as the program advanced, considerable additional information of a fundamental nature was gained through demonstrational operations. Moreover, the Service followed the policy of studying carefully the causes of any important failures of control methods, and structures; and out of these studies new and helpful information was sometimes obtained.

Soil Conservation a Scientific Job. Soil conservation science had its beginning, as I see it, back in 1905, when W. E. McLendon and I learned while making a soil survey of Louisa County, Va., that sheet arosion was gradually planing off the topsoil of unprotected sloping fields—the removal by run-off of rainfall of a layer of soil more or less evenly from whole fields. We found that in the course of several decades, depending on the kind of land and its use, the entire topsoil often was being removed, a thin layer at a time, in the muddied run-off of rainfall, down to entirely different material, subsoil. We soon came to understand that this process, generally unnoticed, was steadily changing countless fields, originally the same, from one kind of land to an entirely different kind—from mellow loam, for example, to stubborn clay (erosion-exposed subsoil).

Then, in the soil survey of Fairfield County, S. C.,[2] in 1911, 90,000 acres of formerly cultivated good land were mapped as rough gullied land, so cut to pieces by erosion as no longer to be suitable for cropping, and an additional 46,000 acres of stream alluvium, formerly cultivated and highly productive, was mapped as meadow, or essentially worthless swamp, as the result of the more frequent overflows, caused by filling of the stream channels with the products of erosion.

In this survey, we have one of the earliest quantitative measurements, by area, of what uncontrolled soil erosion does to productive land. A number of other early soil surveys in various parts of the country similarly gave some quantitative appraisal of erosion damage.

Thus we began the measurement of what erosion does to the land—and people.

In some of the Southern States, with much land devoted continuously to cotton production, some farmers were practically forced into the use of "hillside ditches," laid off by instruments, for slowing down run-off. Here was the first stage in the development of the American field terrace.

[2] Soil Survey, Fairfield County, S. C., Field Operations, Bureau of Soils, U. S. Department of Agriculture, 1911.

This device for soil conservation was used as far back as the 1830's in South Carolina. But agricultural specialists of those times, and a hundred years afterward, failed to subject this method of erosion control to the scrutiny of research. Even a half century later, when Priestly Mangum successfully used his Mangum terrace on his gently rolling farmland near Wake Forest, N. C., no one thought to subject this important structure for slowing down run-off and erosion to any kind of quantitative measurement with respect to its effectiveness. Here and there an occasional farmer would build dams in gullies to stop their growth, but even these were not investigated, although they frequently were built in such a way as to do more damage than good. An occasional farmer would throw cornstalks over his "field washes," but the practice as carried out, had very little beneficial effect.

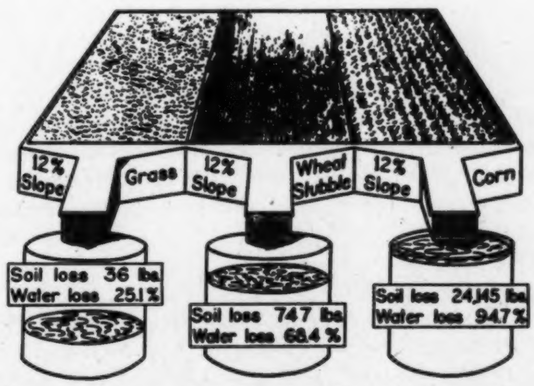
Actually, what we were doing in the United States, generally speaking, with respect to use of the land was to go ahead cultivating fields in whatever way the farmer, without the benefit of science, deemed satisfactory. There was little or no thought of the evil consequences resulting from too rapid run-off of rainfall, accompanied by too rapid removal of topsoil, too much gullying, too much bankrupt farming, etc. What little was being done toward conservation was pretty much guesswork. No one even undertook to determine at what degree of slope, on definite types of land, cultivation of clean-tilled crops should cease and the land be devoted to such protective cover as grass or trees.

Then, finally—and most fortunately—came the soil erosion experiment stations, made possible by the Buchanan amendment to the agricultural appropriation bill for the fiscal year 1930. Some work had been done in the measurement of rates of soil and water losses from a few soil types by the Missouri, North Carolina, and Texas agricultural experiment stations some years prior to the establishment of these much more comprehensive soil erosion experiment stations, on representative types of land in various parts of the country.

Through the work of these stations, I think we can properly say, we moved definitely to break away from ignorance with respect to the ills of erosion, and the necessity for curing them. And so, we made, as noted, many thousands of measurements of soil and water losses by erosion and run-off, under a great many different conditions of slope, soil, climate, and cropping and tillage practices. Terraces, of different types and gradients, were studied on a variety of slopes and soils with respect to their effectiveness and durability. Previously, terraces were frequently built on gradients ranging up to a fall of as much as 30 inches or more in a linear distance of 100 feet. It was on these erosion experiment stations that we learned in the early 1930's, through systematic quantitative measurements, that a field terrace used for clean-tilled crops on the principal types of farmland in the United States seldom should exceed a fall of 6 inches in 100 feet, and generally should not exceed a fall of 3 inches.

Previous to these investigations, many farmers thought that when their lands were terraced, all had been done that needed to be done to stop erosion. On the experiment stations it was learned that on many kinds of land the losses of soil taking place on ordinary terrace intervals amounted to as much as 30, 60, 70, or nearly 90 tons of soil per acre annually, with accompanying losses of rainfall ranging up to 42 percent of the total precipitation. These losses meant that, although the land was terraced, the whole topsoil or a 7-inch surface layer would be lost in something like 10 to 50 years, depending on the land, conditions of land use, and rainfall. This, of course, meant that much more than terracing would be needed to

ZANESVILLE, OHIO
January 1-31, 1937
Rainfall 10.29 in.



There's always a scientific basis for soil conservation techniques. Results of a research study at Zanesville, Ohio, depicted above are among many thousand measurements of run-off and soil losses under varying conditions and localities.

control erosion in any effective manner on these lands than the use of just one conservation measure.[3]

Before these measurements of erosion rates were made, very few people recognized any difference between normal or geological erosion and man-induced or accelerated erosion. When the facts were brought out, it was shown that normal erosion taking place under the protective cover of forest or grass was so slow that soil was built from beneath as fast as it was removed from the surface. In contrast, it was shown that under clean tillage on the same kinds of land, receiving the same rainfall, soil was lost at rates often more than a thousand times faster than under normal erosion—that is to say, at highly destructive rates.

For example, the figures referred to above show that the annual soil loss per acre from Clinton silt loam at the LaCrosse, Wis., soil erosion experiment station, under clean tillage, was approximately 80 tons per acre, annually, whereas under a cover of bluegrass on the same kind of land, with the same rainfall, soil loss for the corresponding period was only 0.03 ton per acre. Thus, clearing and cultivation had speeded up erosion on this land more than 2,600 times and had decreased the life expectancy of the productivity of the land from around 30,000 years to about 11 years.

Prior to the advent of this kind of scientific knowledge, developed at the erosion experiment stations, not much in the way of quantitative facts was known with respect to accelerated run-off from protected and unprotected farmlands and how this run-off affected flood conditions. An example of how run-off varies may be cited from results measured on the Zanesville, Ohio, erosion experiment station. In 1937, just before the big Ohio River flood, 11 inches of rain fell on the station during January. The measured loss of water as immediate run-off from a gullied cornfield amounted to 95 percent of the total rainfall, while only 32 percent ran off woodland of essentially the same slope, and 26 percent from the same kind of land covered with bluegrass. During this period 95 tons of soil per acre were lost from the gullied cornfield, but only 0.02 ton per acre from the bluegrass area (or one-four thousand seven hundred and fiftieth as much as from the cornfield).[4]

[3] See Soil Conservation, by H. H. Bennett, p. 129. McGraw-Hill Book Co., Inc., New York. 1939.

[4] Bennett, H. H. Adjustment of Agriculture to its Environment.

Now under the scientific procedure of measuring the effects of soil erosion and soil conservation, we are beginning to learn that soil conservation practices are not more expensive or time-consuming, as some have asserted, but rather they are less expensive and less time-consuming than the old wasteful ways of farming. That is to say, it is easier and cheaper to farm right than it is to farm wrong, and you save your land in the meantime.

It was found, for example, in plowing wheat stubble with a tractor-drawn disk plow, at Hays, Kans., that 22.4 percent more fuel was consumed in going up and down the slope than doing the same work on the contour, on the same type of land, and it took 9.8 percent less time operating on the contour than it did plowing up-and-down hill.[5]

Conservationist's Definition of Land. Land is not synonymous with soil in the science and practice of soil conservation. Soil is a part of land—a very important part. It is something that can be sampled and analyzed in a laboratory to determine its chemical composition; it can be scrutinized in the field with sufficient accuracy to determine certain outstanding textural and structural characteristics. But land to the conservationist is more than soil. It is soil that occupies definite slopes, such as cannot be sampled, but which, nevertheless, can be exactly determined with a level. And, since soil is generally subject to marked changes and deterioration by erosion, it is necessary to consider the effects of erosion, or the erosion hazard, as a part of the definition of land. These characteristics, moreover, vary greatly with the climate, frequently within short distances. Thus, to the conservationist, soil, slope, degree of erosion (or the erosion hazard), and climate, together constitute land.

Variations in land are numerous, but they are all duly considered in modern soil conservation practice.

Tools of Conservation. Since soil conservation is the proper use and care of land, so that it will produce maximum yields conforming with adequate protection, all measures that help keep land in condition favorable to sustained good production are the tools of conservation. Terracing, contouring, closing of gullies; maintenance of organic matter; appropriate use of grass, legumes, shrubs, trees, crop rotations, fertilizer; drainage where the land is too wet, and irrigation where it

[5] Barger, E. L. Power, Fuel, and Time Requirements of Contour Farming. Agr. Engineering, April 1938, p. 155.

is too dry—all of these and whatever else is needed to keep the land permanently in place and always productive are conservation tools necessary to getting the job of soil conservation effectively performed. These tools are used singly where the land is easy to stabilize, and in combination, one supplementing another, where the conservation needs are more complex. In other words, soil conservation includes any and all measures that will in any way help increase the productivity of the land and make it keep on producing satisfactory yields.

Scientific Treating of Land. If there were some standardized, simple method for stabilizing land or some remedy for its ills that could be applied indiscriminately, the job of soil conservation would be comparatively easy. But there is about as much variety in the land and in the performance of water, wind, temperature, and plants, as in the highly complicated landscape of the country. Control methods that work wonders in the cotton country may do more harm than good on the wheatlands of the Great Plains. And many of those that are quite practical on the high-yielding corn lands of the Midwest may not be appropriate for the dairy and vegetable lands of the Northeast. Even on neighboring farms, and often in the same field, land problems are almost never completely identical. And in those localities where much of the precipitation is in the form of snow, special measures are required to safeguard farm and range land. In short, the soil and water conservation program must be sufficiently flexible to meet all the possible conditions and needs.

The specific land treatments used and recommended by Soil Conservation Service technicians may, therefore, vary from one valley to the next, from farm to farm, and even from field to field. Before any work is done, each farm or ranch is carefully analyzed, both as a piece of land and as a business enterprise.

In making a physical analysis to determine productivity, needs, etc., field men of the Service carefully note, on the ground, the exact lay of the land, the quality of the soil, the degree of erosion damage, and the prevailing erosion hazards on every acre of every field, woodlot, and pasture over the entire farm. As accurately as possible, these conservation technicians determine which lands can be cultivated under good farm practices without excessive loss of soil and rainfall, and at reasonable cost in labor and materials; which lands need the protection afforded by special crop arrangements and special tillage practices or structural installations; and which ones require a permanent cover of trees, grass, or other protective vegetation. In those localities where irrigation is practiced, specialists are even sent every year into the snow-bearing mountains of the upper watersheds to determine how much water the farmers in the valley below may count on for seasonal plantings when the deposits of snow melt.

The Conservation Technician Works with the Farmer in His Fields, Pastures, and Woodlots. The next step is to work out with the farmer a farm plan for practical operation, based, as pointed out above, on-the-ground information acquired and translated into eight simple land-capability classes.[6] *This job of developing the farm plan* as already noted, *the soil conservation technician does, not indoors around a table, but out in the fields, pastures, woodlots, gullies, and abandoned and idle areas, working along with the farmer himself—with all the pertinent facts immediately at hand for full and understanding consideration.*

In some cases, the new farm arrangement, based on the physical aspect and needs of the land, may not entirely fit the farmer's economic situation. It may call for more hay crops than he actually needs or can sell and not enough potatoes or corn or wheat; it may propose other changes the farmer cannot afford to make. If so, it is not a good arrangement in a practical sense, and however scientific it may be, it must be adjusted, of possible, to meet family needs, market opportunities, and the farmer's personal preferences. Purely from the conservation standpoint, however, the farm arrangement based on physical land analysis is ideal. As already pointed out, the closer the farmer can approach it and still make a good living, the more stable and productive his land will be, and the surer his income, over the long run.

After Making the Farm Plan, Comes the Job of Application to the Land. Drawing up a satisfactory land-use and land-protection plan for a farm is only half the job—or less. The other half involves the actual application of the plan to the land.

Each parcel of land generally needs some special practice or treatment for adequate protection and efficient, maximum production. Taking these into account, the farm plan is made with enough flexi-

[6] See lower photograph page 84.

bility to allow a choice of crops to be grown and methods to be used. Steep or unproductive croplands, for example, may be earmarked for a permanent cover of grass or legumes, or trees; farm woods may be planned where grass is not paying out or is failing to hold the soil, and vice versa; gullied areas may be turned into grass-covered waterways, farm sanctuaries for animals and birds, or valuable pastures of kudzu.

Croplands generally should be farmed in rotation, as nearly on the level as may be practicable, and sometimes in strips. On the more erodible slopes, terraces or diversion ditches are frequently needed for added protection. Pastures often need to be contour-furrowed, limed, fertilized, cleared of weeds before the seeds mature, and grazed with caution to improve the growth of grass. Woodlands need to be fenced to keep out livestock, and they need to be protected from fire and managed according to scientific principles of forestry. These are only a few of the dozens of erosion-control practices that may be called into use to fit particular situations.

Here we have the scientific practice of soil conservation, arrived at out of the science of soil conservation.

Save the SOIL and Save TEXAS

By Walter R. Humphrey

Editor, Fort Worth Press

THE JOB of saving America's soil is everybody's job.

It is everybody's business, and the Fort Worth Press is undertaking to make it just that through its recently instituted Save the Soil and Save Texas campaign.

The press has gone beyond its normal program of telling the public about soil conservation, its needs and accomplishments, and has set out to reward those who distinguish themselves in the battle against erosion.

This newspaper's campaign is designed to recognize with suitable awards those who have made notable achievements during the year in soil conservation work.

This year, 1946, saw the first awards presented. The occasion was a soil conservation dinner in Fort Worth last June.

Organizations assisting in the sponsorship of the campaign presented $3,000 in cash awards for the following achievements:

One thousand dollars to the soil conservation district in north and northwest Texas with the greatest percentage of its work agreements completed; $1,000 to the soil conservation group (or community) on the same basis; $500 to the man making the greatest unselfish contribution to soil conservation; $500 to boys and girls in an essay contest on the subject, What Soil Conservation Means to My Community.

In addition, the Fort Worth Lions Club presented a plaque to the outstanding farmer in each of the 13 competing districts, and the Press gave certificates to all farmers who had completed their soil conservation programs and still had them in active operation.

Assistant Secretary of Agriculture Charles F. Brannan came down from Washington to do the honors.

The response to this first program was spontaneous and enthusiastic. There was but one natural result: its State-wide expansion.

In 1947, therefore, all Texas will be competing for, "Save the Soil" awards. The prize list will include $10,000 in cash, 135 plaques, certificates and other recognitions.

As in the regional program this year, the 1947 program will be carried on through the organized soil conservation districts—there are 130 of them in Texas today.

The set-up for the "Save the Soil and Save Texas" campaign was worked out initially in cooperation with the Texas State Soil Conservation Board, the Soil Conservation Service.

The supervisors became the key to the program from the start and will continue in their key position as the program becomes an annual Texas-wide affair. Records maintained by the supervisors are the basis for making awards. The supervisors met in advance of the first program and established their own score card. Judging then became simply a matter of checking. This procedure will be followed again in 1947. The State Association of Soil Conservation District Supervisors will be the rule-making body. It is the work of supervisors and cooperating farmers throughout Texas that the Press seeks to recognize.

Since districts are set up under State law, the entire operation of the plan has a State tie-in, rather than Federal.

However, the advice and technical assistance of Soil Conservation Service personnel has been fundamental. Bill Durham, regional editor of the Fort Worth Press, who directed the first program, will be in charge in 1947. As an ardent conservationist who has followed the conservation program in Texas closely since the establishment of the first experiment stations, the initiation of the Elm Creek project by the old Soil Erosion Service east of Temple, Tex., and the long fight for the passage of a State soil districts law, I feel that this program of recognition ought to get somewhere in popularizing the great work done by conservation pioneers.

Many agencies have offered their cooperation. The Brazos River Conservation and Reclamation District will present $1,000 in awards for achievements in the 44,600-square mile Brazos watershed. The Trinity Improvement Association, which cooperated in the first awards dinner, will participate in some manner in 1947. Sponsors who have put up the money for cash awards have given from $500 to $1,000 and have been enthusiastic participators in the plan for recognizing achievements.

Although the Fort Worth Press does not have a State-wide circulation, it has felt that it has very properly taken the lead in setting up a continuing program in which all the State can take part.

There are no selfish motives behind the campaign, other than to make a contribution to the development and growth of Texas.

Tentatively, the 1947 Awards Dinner will be held on the anniversary of the first—June 1.

Secretary of Agriculture Clinton P. Anderson, who originally had intended being on hand for the first awards-giving, has asked that he be invited again. And he most certainly will be.

Thanks to the cooperation and enthusiastic assistance of men who are devoting their lives and careers to soil conservation work, the Save the Soil and Save Texas program is off to a remarkable start.

We would like to make heroes out of men who have done an outstanding job in saving the soil in their communities.

We think they deserve that kind of recognition—the acclaim of a grateful State, and substantial cash!

They are some of the great people of this day.

Population and Resources

(Continued from page 83)

manent basis at a high level of living if land-use practices are dictated by soil science and *not* dictated by population density and an ever-increasing population. Our population already numbers 140,000,000. It has increased 40,000,000 or 40 percent during the past 35 years (which included two world wars and a serious economic depression). With all due respect to recent forecasts that our population will cease to increase after it increases 30 or 40 more millions, no one can be certain that it will stop increasing short of 200,000,000, or even more.

It certainly would be an uncomfortable position in which to find ourselves half a century or a century hence with 200,000,000 people in this country but with scarcely enough mineral resources and top soil to adequately support half this large number on a permanent basis.

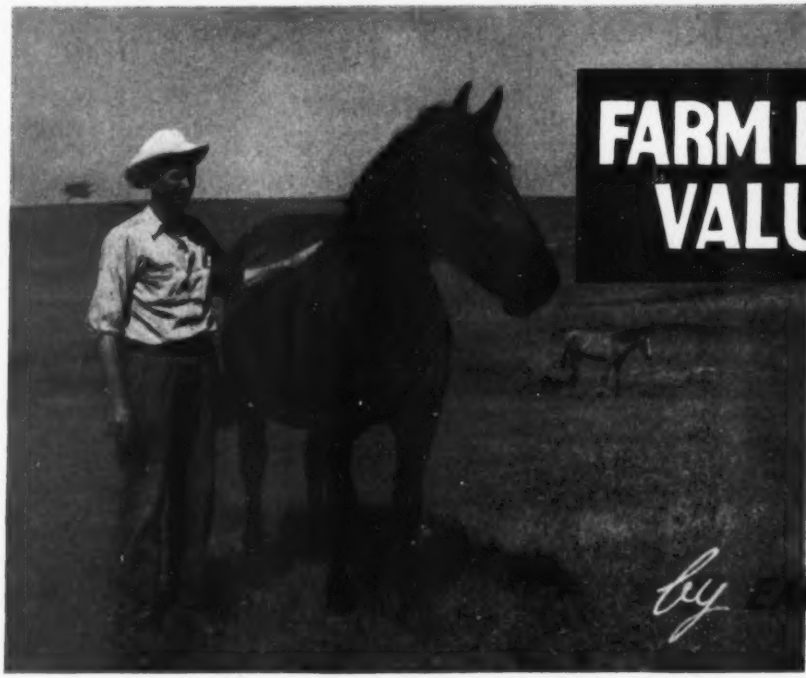
True, the United States during the war emergency produced one-third more food than it did before the war. We also made spectacular increases in food production during World War I, but we must not forget the dust storms of the early 1930's. Thanks to the Soil Conservation Service we have been wiser during this war, and thanks also to favorable weather while many other parts of the world were suffering severe droughts. We should also remember Dr. Bennett's statements that "actually we need more good land for crops now," and "Too many farmers are working poor land that should be turned back to grass or woodland."

NICHOLS RECOGNIZED BY WAR DEPARTMENT

"For outstanding assistance to the Ordnance Department through the advancement of the program of studying the physical characteristics of soil and applying the data obtained to the design of vehicles" during the war, a certificate of appreciation has been awarded Dr. Mark L. Nichols by the War Department. The Department expressed "its appreciation for patriotic service in a position of trust and responsibility" to the man who heads research work of the Soil Conservation Service.

FARM DOUBLES VALUE IN 6 yrs.

by EARL SMITH



Sale of Belgians nets Jones a tidy profit.

THREE successive years of poor crop yields and low income prior to 1939 convinced Walker Jones, Wagoner, Okla., that there must be some more profitable use for his 440-acre farm than cultivation. The land had cost him only $15 per acre, but Jones knew he was losing money when his run-down land averaged 10 bushels of corn and 8 bushels of wheat per acre.

Having considerable experience with livestock, Jones decided to see what he could do with cattle. With that in mind, he applied to the Verdi-Grand soil conservation district for assistance in planning a livestock program.

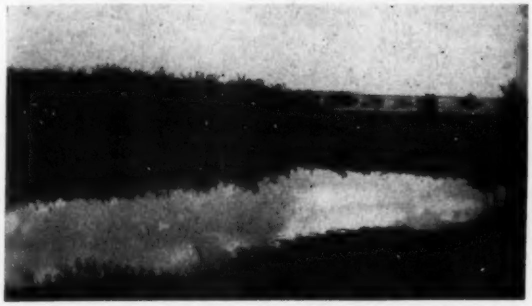
Two technicians of the Soil Conservation Service walked over the entire farm with Jones. Together, the three agreed that all cultivated land except 95 fertile acres along a small creek could profitably be devoted to pasture. Forty-five acres were set aside for homestead, barn, roads, creeks, farm ponds, and post plantings.

With the changes in land use decided on, the technicians and Walker sat down and worked out a detailed plan of conservation operations.

Following the plan during the past 6 years, Jones has overseeded his 300 acres of pasture land with Korean lespedeza, yellow hop clover, white

Still another source of income—Jacks.

NOTE.—The author is work unit conservationist, Soil Conservation Service, Wagoner, Okla.



One of the two ponds which provide water for livestock plus good fishing. The black locusts on the other side produce fence posts and cover for wildlife.

These sheep can't begin to eat down the tall grass in Jones' Bermuda pasture. Here they're clustered on a diversion terrace.

clover, and ryegrass. Some native bluestems grass was present when he began the pasture development. He has spread an average of 100 tons of barnyard manure on the pasture land each of the past 3 years. More than 300 tons of agricultural limestone and 16 tons of superphosphate also have been put on the grasses.

The conservation measures now installed include diversions to keep water from rushing over areas likely to wash and gully easily, terraces, terrace outlets, contour cultivation, contour sodding, post-lot planting, and two farm ponds. Jones follows a regular system of rotation grazing to allow his pasture grasses to attain maximum usefulness.

Twice a year, in June and August, the pasture is mowed to control weeds. Jones estimates that it will carry one head of livestock per acre for at least 8 months each year.

Barnyard manure has been applied on the 95 acres of cropland in about the same proportion as on pasture. Also, a soil-improving legume is regularly used in the crop rotation. Now, where cotton made 150 pounds of lint per acre before 1939, Jones gets a bale to the acre. His wheat produces 15 bushels per acre, instead of 8 bushels as formerly, and his corn has jumped from 10 bushels prior to 1939 to 30 bushels now.

When he began conservation farming Jones had 40 grade Hereford cows, 30 calves and 7 horses. He has sold most of the grade stock and replaced them with registered Herefords. His herd now numbers 103 cattle. Other stock includes registered Belgian mares, stallions, jacks and jennies, several quarter-horses, a flock of bronze turkeys, 100 high grade sheep, and several registered rams.

In 1944 Jones' income from sales was $7,091, while his expenses, chiefly for protein feeds, were

One result of farming in cooperation with the Verdi-Grand soil conservation district. Attractive home and grounds, and a family situated to enjoy them.

$3,864. That left him a net income from sales of $3,226—on land that cost $15 per acre. Jones believes his 6 years of conservation farming have doubled the value of his farm.

NIGHT CLASSES FOR GOVERNMENT WORKERS

Courses now being offered by the Graduate School of the United States Department of Agriculture reflect the desire of the Department to keep its young scientists and technicians informed and "growing in their work." They also offer an opportunity for specialists to broaden their fields of interest by studying related subjects. The faculty is recruited from neighboring institutions of learning and from among recognized authorities in the Government.

Teachers drawn from the Soil Conservation Service include A. E. Brandt, Verna C. Mohagen, J. Gordon Steele, John H. Wetzel, Mark L. Nichols, and John G. Sutton.

FARM FISH PONDS IN SOUTH AFRICA

Modern production of fish for food from farm ponds is being encouraged in other lands. Charles R. Enlow, now agricultural attaché to the Union of South Africa, sends us a clipping from a local newspaper. It quotes Dr. Hey, South African fisheries expert, who says:

> The potentialities of inland fisheries in Rhodesia may be roughly grouped under three headings, first and foremost of which would be fish farming. . . . The object of fish farming is to utilize the farm dam as an additional land from which a food crop can be produced. It is possible for any farmer, or native village for that matter, to grow fish in the same way as one would grow an agricultural crop or rear farm animals.

Dr. Hey then goes on to describe fish-rearing methods similar to those recommended by Soil Conservation Service technicians, including the fertilizing of pond waters. He also calls attention to the need for utilizing existing river systems for native fish and the development of fishing as a recreational resource in South Africa. He sees the close relation between fisheries and soil conservation, and states:

> A resource may also be destroyed by man's interfernce with the habitat. Erosion in the catchment areas silts up rivers, industries discharge their waste into rivers and even large dams may check spawning runs. Conservation, therefore, is the concern of every man, woman and child of every nation. Our very existence upon this planet depends upon the conservation of two basic resources—soil and water.

REVIEWS

GRASSES AND CULTURAL METHODS FOR RESEEDING Abandoned Farm Lands in Southern Idaho, R. H. Stark, J. L. Toevs, and A. L. Hafenrichter. (Coop. U. S. D. A. and Idaho Experiment Station.) Idaho Station Bulletin 267. 36 pages, 10 illustrations. 1946.

The widespread "plow up" of native grass and range lands for wheat production during World War I resulted in soil depletion, serious wind and water erosion and land abandonment throughout dryland farming areas.

The restoration of these lands in keeping with their potential use value for permanent agriculture has been a major conservation achievement of the last three decades.

World War II, with its enormous demands for human food has caused a repetition in large measure of the "plow up" that was so costly and disastrous a generation ago.

This bulletin is so timely and complete with research information about adapted grasses, methods of establishment and conservation practices suited to the restoration of abandoned dry farm lands that the usual policy of the Service magazine has been extended to include this technical review.

Methods for converting eroded abandoned wheatlands to dryland pasture by reseeding in keeping with proper land use are reported. Comparison of six grasses and eight mixtures, each containing two grasses, are given for stands of different age. Cultural practices included four methods of seedbed preparation, four types of drills and three dates of seeding. Total production, calculated grazing capacity and basal densities from planted grasses and from volunteering cheatgrass are given.

Summer fallowing was the best seedbed preparation. Summer fallowing extended planting dates, made possible the use of several new grasses, and advanced the development of the stands to full production. On summer fallow, fall and early spring seedings of crested wheatgrass (*Agropyron cristatum*) and bluebunch wheatgrass (*A. spicatum*) were successful in all years. Late spring seeding was successful 2 years in 3. Satisfactory seedbeds for fall plantings were also obtained by burning cheatgrass in late spring and by duck-footing the land just prior to seeding, except when fall rains were below normal. Seeding directly into cheatgrass in the fall resulted in poor stands and retarded development by at least 1 year.

There were no significant differences in stand or yield due to the use of different types of drills, except where plantings were made without seed-bed preparation. In this case the deep-furrow and the double-disk drills were best.

Wheatgrasses, both exotic and native, and native bluegrasses were best adapted to conditions of abandoned land and low rainfall. When stands of the bunch wheatgrasses, *A. spicatum*, *A. cristatum*, *A. elongatum*, and of the sod-grasses, *A. smithii* and *A. dasystachyum* had reached full development, there were no significant differences in production. *A. cristatum* reached full development 1 year sooner than the other wheatgrasses. The 3 bunch wheatgrasses have different seasons of use. *A. elongatum* was the latest of all, and extended the grazing season as much as 30 days into the rainless summer months after the other grasses were dry and fibrous. *A. spicatum* was 2 weeks later than *A. cristatum*. The season of use for *A. smithii* corresponded to that of *A. spicatum* and that for *A. dasystachyum* to *A. cristatum*. By seeding separate pastures to grasses with different season of use, the grazing season was extended by 4 to 6 weeks.

Alternate-row mixture seedings of bunchgrasses and of bunch and sodgrasses gave no significant differences in production or grazing capacity from pure-stand seedings. Bunchgrass determined the yield when mixtures of bunch and sodgrasses were used. Bunch wheatgrasses determined yield when seeded with big bluegrass (*Poa ampla*). A dwarf sodgrass (*A. riparium*) was adapted to the low rainfall conditions (8.89 inches) and provided excellent ground cover between bunchgrasses, but its production was low.

Alternate-row seedings of Michels' rye and crested and bluebunch wheatgrass allowed full establishment of the grass, produced more than a ton of rye hay the year after seeding, but the rye retarded the full development of the grass stands by 1 year.

The basal density of planted grasses was correlated with yield. The basal density of volunteer cheatgrass was correlated with its yield. The basal density of planted grass was negatively correlated with the basal density of the cheatgrass. All coefficients were highly significant. Fully developed stands of planted grasses had an average basal density of 2.67 percent and produced 1,173 pounds of air-dry forage per acre. The average basal density of cheatgrass (alone) was 2.64 percent with a yield of only 607 pounds.

Selected strains of all grasses except *A. cristatum* were used. They were chosen for their adaptation to the conditions commonly found on eroded abandoned wheatlands. New species adapted to this conservation use were *A. spicatum*, *A. elongatum*, *A. dasystachyum*, *A. riparium*, and *P. ampla*.

REFERENCE LIST ☆☆

Compiled by William L. Robey, Printing & Distribution Unit

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[1] From the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Kathryn Fravell is getting experience working on her father's farm near Mount Vernon, Ohio, in case she should hop across the pond some time to operate a combine in England.

(*See "Introducing InLaC" in this issue.*)